

## REMARKS

### Summary of Office Action

As an initial matter, Applicants note with appreciation that the Examiner has indicated consideration of the Supplemental Information Disclosure Statement filed September 22, 2010.

Claims 22-25, 28-41 and 43 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Sondhe et al., U.S. Patent No. 5,340,652 (hereafter "SONDHE"), in view of Gajewski, U.S. Patent No. 4,895,806 (hereafter "GAJEWSKI"). In this regard, the Examiner is **again** respectfully requested to make GAJEWSKI officially of record on a Form PTO-892.

Claims 26, 27 and 42 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SONDHE in view of GAJEWSKI and in view of Motsinger et al., U.S. Patent No. 3,217,536 (hereafter "MOTSINGER").

### Response to Office Action

Reconsideration and withdrawal of the rejections of record are again respectfully requested, in view of the following remarks.

#### *Response to Rejection of Claims 22-25, 28-41 and 43 under 35 U.S.C. § 103(a)*

Claims 22-25, 28-41 and 43 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SONDHE in view of GAJEWSKI for the reason set forth in the previous Office Action. The previous Office Action essentially alleged that SONDHE discloses an article comprising an epoxy base coat and a urethane top coat that can be

applied at ambient temperatures to the epoxy base coat, but fails to disclose the presently claimed urethane topcoat. The previous Office Action further alleged that GAJEWSKI discloses a polyurethane composition that can be applied to substrates to be coated without the need for molds and comprises the reaction product of an isocyanate-terminated polyurethane prepolymer (which the Examiner alleged to qualify as an aromatic polyisocyanate), and a curative agent that comprises a polyol as recited in the instant claims, an aromatic diamine and an aliphatic amine. In the previous Office Action the Examiner further took the position that one of ordinary skill in the art would have been motivated to replace the urethane topcoat of SONDHE by the polyurethane composition of GAJEWSKI.

Applicant respectfully traverses this rejection for all of the reasons which are set forth in the response to the previous Office Action. The corresponding remarks are expressly incorporated herein.

It further is noted with appreciation that the Examiner “understands the difference between [isocyanate-terminated polyurethane] prepolymers [used for the production of the polyurethane composition of GAJEWSKI] and polyisocyanates [employed by SONDHE]”. However, the Examiner now takes the position that “all reaction components are present and the fact that Gajewski first formed a prepolymer would not effect [*sic*] the final polyurethane composition as a whole”. Page 4, first paragraph of the instant Office Action. See also the paragraph bridging pages 4 and 5 of the instant Office Action.

Applicant respectfully disagrees with the Examiner in this regard. The Examiner’s attention is directed to the “Declaration under Rule 132” filed October 28, 2009 and in

particular, page 5, section 16 thereof wherein it is set forth (with reference to Rosenberg et al. U.S. Patent No. 6,046,297) that the reaction of an (amine-free) polyol with isocyanate leads to prepolymers which cannot be further reacted with the aromatic amine MCDEA, which clearly indicates that the order of addition of the components does affect the final polyurethane composition as a whole.

Further, Applicant is submitting herewith copies of two documents, i.e., *Kunststoff-Handbuch*, Volume 7 "Polyurethane", 1983, pages 18-21 by Dr. D. Dieterich (hereafter "DIETERICH I"), and D. Dieterich, "Aufbau von Netzwerken aus Präpolymeren" (Structure of Prepolymer Networks), *Angewandte Makromolekulare Chemie* 76/77 (1979), pp. 79-107 (hereafter "DIETERICH II"). DIETERICH II is cited in DIETERICH I.

DIETERICH I and DIETERICH II are background information and provide evidence that one of ordinary skill in the art is well aware that the one-shot process and the prepolymer process for making polyurethanes are two very different procedures that afford very different polyurethane products, wherefore one of ordinary skill in the art will not assume that these products can be used interchangeably.

Specifically, in Section 2.3.1.1 DIETERICH I describes the one-shot process wherein the reactive components are directly mixed. In contrast thereto, according to the prepolymer process described in Section 2.3.1.2 of DIETERICH I polyurethane elastomers and polyurethane ureas are prepared via NCO-prepolymers as intermediates. As shown in Fig. 2.1 at page 20 of DIETERICH I, NCO-terminated prepolymers can be prepared from diol with a stoichiometric excess of polyisocyanate. OH-terminated prepolymers can be prepared from polyisocyanate with a stoichiometric excess of diol. At

the bottom of page 20 of DIETERICH I it further is explained that polyurethane ureas (“Polyurethanharnstoffe”) are prepared by chain extension of NCO-prepolymers with amines.

Turning now to Section 6.2 at page 94 of DIETERICH II, it is set forth therein that the preparation of urethane elastomers from NCO-terminated prepolymers results in segmented chains with hard segments (“Hartsegment” shown in the reaction scheme at page 94) and soft segments (“Weichsegment” shown in the reaction scheme at page 94).

Specifically, as described in DIETERICH I in a first stage (I) the NCO-terminated prepolymer is prepared from diol with a stoichiometric excess of polyisocyanate. This affords the NCO-terminated prepolymer (soft segment). In a second stage (II) the soft segment, NCO-terminated prepolymer is then chain extended. The reaction scheme at page 94 of DIETERICH II shows the chain extension with a diol. However, the chain extension with a diamine as referred to at the bottom of page 20 of DIETERICH I would proceed in a similar manner.

It is apparent to one of ordinary skill in the art that in contrast to the “segmented” product of the prepolymer process the product of a one-shot process is not segmented because the reactive species react in a random fashion. This is similar to the production of a block copolymer and a random copolymer. Hence, it is clear from the Declaration by the Applicant and DIETERICH I and DIETERICH II that the prepolymer process affords a product that is chemically distinct from a product that is obtained from the same starting materials but by a one-shot process. For this reason alone, one of ordinary skill in the art cannot reasonably assume that the one-shot polyurethane employed by SONDHE

can be replaced by the prepolymer polyurethane disclosed by GAJEWSKI without affecting the properties of the final product.

It additionally is to be taken into account that the required property profiles of the polyurethanes of SONDHE and the polyurethanes of GAJEWSKI are different. For example, the polyurethanes of SONDHE, to be used specifically as topcoats for road lane markers, have exceptional weatherability, abrasion resistance and non-yellowing characteristics (see, e.g., abstract of SONDHE). On the other hand, the polyurethanes of GAJEWSKI, to be used as coatings for cylindrical parts such as rolls for steel mills and paper mills, are to be suitable in a rotational casting process (see, e.g., paragraph bridging columns 1 and 2 of GAJEWSKI). With respect to the rotational casting process, GAJEWSKI explains in col. 1, lines 51-58 thereof (emphasis added):

Rotational casting reduces the number of steps involved in roll coating. However, if the polyurethane reaction mixture gels too slowly, the polyurethane coating will drip off the roll. If the polyurethane reaction mixture is formulated to gel quicker, the polyurethane can gel in the head of the mixer or ridges can develop on the outer surface of the roll requiring machine finishing of the polyurethane coating on the surface of the roll.

Further, in col. 4, lines 45-50 and 60-65 GAJEWSKI states (emphasis added):

The synergistic combination of the thixotropic aliphatic amine and the thixotropic colloidal additive in the polyurethane composition results in a polyurethane composition which flows effectively and resists undesirable dripping when the composition is used for rotational casting.

The polyurethane composition of this invention can be reacted, mixed, and applied at ambient temperatures and can be applied to the substrates to be coated without the need for molds. Use of the polyurethane composition of this invention in rotational casting results in minimal dripping and ridging of the coating on the rolls covered.

In col. 6, lines 8-17 thereof GAJEWSKI reports on the properties of the polyurethane composition prepared according to Example 3 thereof (emphasis added):

Use of the composition of Example 3 resulted in no dripping and a significantly improved thickness per pass compared to the compositions of the three Comparative Examples. Surprisingly, use of the fast-curing aliphatic amine Jeffamine<sup>TM</sup> T-403 in the composition of Example 3 did not result in reduced pot life. Similarly, the 1-inch tolerance was not adversely effected by the addition in-situ of Jeffamine<sup>TM</sup> T-403 and Aerosil 200 in the composition of Example 3, indicating the absence of the ridging problems often found in prior methods of roll coating.

The above passages of GAJEWSKI make it clear that the polyurethane described therein must not cure too rapidly and must not cure too slowly to avoid problems such as dripping (curing too slowly) and ridge formation (curing too rapidly) in a rotational casting process.

In contrast to the polyurethanes of GAJEWSKI, the polyurethanes of SONDHE are not intended to strike a balance between curing too slowly and curing too rapidly, but are required to cure as quickly as possible. For example, in col. 21, lines 9-35 SONDHE states (emphasis added):

The foregoing examples illustrate the advantages of the present invention. Specifically, the present invention has no volatile organic components. The organic structure when based on aliphatic compositions rather than aromatic compositions has superior weatherability and resistance to discoloration. The intermediate isocyanate chemistry results in a urethane which is flexible and yet tough to very rigid by varying the chain length of either the intermediate or the isocyanate prepolymers or monomers. The resulting composition has excellent physical properties for the intended use as well good chemical properties. The method of application results in a permanent chemical fusion between the layers. The epoxy layer has good wetability, while the urethane layer allows for a short tack free time. The short tack free time limits the amount of time that dirt can make it onto the surface, and shortens the time before cars can drive on the surface. The chemical fusion between the layers can be understood as the chemical reaction between the two layers which becomes a part of the polymeric structure having no discrete interface, but a form of crosslinking between the layers. It is possible to drive over the present composition within 5 to 10 minutes without harming the composition.

whereas in contrast, in the past it has been necessary to wait a cure time of 60 to 75 minutes.

This is further confirmed by col. 13, lines 29-36 of SONDHE (emphasis added):

The two-part solvent free, generally liquid, urethane system which can be stored in separate containers is mixed in any convention manner, and generally applied under pressure to the top of the previously applied epoxy composition. Upon mixing, the two-part urethane system will immediately commence reaction and hence it is immediately applied to the base layer before any substantial crosslinking or curing reaction occurs. Application can be in any conventional manner as by brushing, spraying, and the like. The thickness of the urethane layer will depend upon the surface being treated and the degree of protection sought and with regard to road lane marker, the urethane is generally applied at a thickness of from about 0.5 to about 10 mils, desirably from about 0.75 to about 5 mils, and preferably 2 or 3 mils.

The difference in required curing times is yet another reason why one of ordinary skill in the art wishing to replace the polyurethane used in the process of SONDHE would not have an apparent reason (but rather be discouraged) to use a polyurethane according to GAJEWSKI.

Further, even if one were to disregard the above differences, it is still not seen what would motivate one of ordinary skill in the art to add an extra step (preparation of a prepolymer) to the process described by SONDHE. It is noted that in this regard the Examiner relies upon col. 21, lines 15-20 of SONDHE, alleging that SONDHE “discloses intermediates such as isocyanate prepolymers that can be formed during the process, which is then further chain extended, much in the same manner as the Gajewski reference”. Page 4, first paragraph of the instant Office Action.

In this regard, it is submitted that there is a difference between a speculation regarding the possible mechanism of the polyurethane formation during the one-shot process (SONDHE) and an actual prepolymer process. In other words, merely because

SONDHE speculates that prepolymers may be formed during the one-shot process one of ordinary skill in the art does not have an apparent reason to separately prepare any prepolymers first to thereby add an additional step to the process of SONDHE. At any rate, if one were to assume that prepolymers are formed during the one-shot process there is no reason to prepare these prepolymers first and in a separate step to thereby only add to the complexity of the process without obtaining any benefit therefrom.

It further is noted that at page 4, second paragraph of the instant Office Action the Examiner alleges that “[a] person of ordinary skill in the art would understand that even though Gajewski discloses the formation of NCO-terminated prepolymer, he did not disclose the elimination of unreacted isocyanate and as such the unreacted isocyanate should still be present in the (B) side of Gajewski.”

Applicant fails to see the relevance of the Examiner’s conclusory statement in the instant context. Even if one were to assume, *arguendo*, that the Examiner’s unsupported allegation that the NCO-terminated prepolymer of GAJEWSKI contains unreacted isocyanate, one of ordinary skill in the art will readily understand that this does not make the process of GAJEWSKI a one-shot process and thus, similar to the process described by SONDHE.

Regarding the allegations in the first full paragraph at page 5 of the instant Office Action, it is submitted that in the response to the previous Office Action Applicant has referred to Adams, U.S. Patent No. 4,571,798, merely because the Examiner had asserted that “from personal work experience, the Gajewski reference discloses polyurethanes



suitable for the production of industrial rolls such as paper mill rolls. Industrial sized polyurethane paper mill rolls consist of two layers, a base layer, which is normally an epoxy resin, and a topcoat layer which is normally the polyurethane resin disclosed by Gajewski”.

ADAMS is one of the two documents cited in GAJEWSKI which relate to paper roll mills. However, ADAMS fails to mention an epoxy layer or any other layer between the metal core and the polyurethane elastomer. The other document that relates to, *inter alia*, paper mill rolls and is cited in GAJEWSKI, i.e., Watanabe, U.S. Patent No. 4,468,598 (hereafter “WATANABE”), describes a polyurethane rubber covered roll that comprises a metallic roll core, a reinforcing layer adhering to the outer surface of the roll core, and formed by a nonwoven fabric impregnated with a mixture of a thermosetting resin and a fine inorganic powder, and a layer of polyurethane rubber united integrally with the outer surface of the reinforcing layer. See, e.g., abstract of WATANABE. Although the thermosetting resin which impregnates the nonwoven fabric may be an epoxy resin, the base layer of the role of WATANABE clearly is not merely an epoxy layer. Further, regarding the adhesion between the (epoxy-) impregnated nonwoven fabric and the polyurethane rubber WATANABE states in col. 5, lines 23-37 thereof (emphasis added):

The layer of elastomeric material 3, which is formed about the reinforcing layer 2, is usually secured thereto by an adhesive layer not shown. Suitable examples of the elastomeric material include polyurethane rubber, silicone rubber, polychloroprene rubber, chlorosulfonated polyethylene, butyl rubber, acrylonitrile-butadiene rubber, styrene-butadiene rubber, ethylene-propylene-cyclopentadiene copolymer, and natural rubber. If, for example, polyurethane rubber is employed, the layer 3 usually has a thickness of about 10 to 20 mm.

For the adhesive layer not shown, it is preferable to use an adhesive sharing a constituent with the elastomeric material forming the layer 3. For example, it is

preferable to use an isocyanate adhesive if polyurethane rubber is employed for the layer 3.

See also Examples 1, 6 and 7 of WATANABE wherein the use of an adhesive is expressly mentioned (it is not completely clear if the adhesive was used in the remaining Examples as well). In other words, WATANABE provides evidence that in paper roll mills the adhesion between epoxy resin and polyurethane may be a problem, contrary to what has been asserted by the Examiner.

It further is submitted that the documents newly introduced (but not cited in the rejection) by the Examiner, i.e., U.S. Patent Nos. 3,520,747 and 3,646,651 (both to McGaughey et al.) do not relate to paper mill rolls. However, they appear to confirm that the adhesion between a (fiber-reinforced) epoxy layer and a polyurethane rubber layer alone is not very good. For example, according to col. 5, line 69 to col. 6, line 14 of U.S. Patent No. 3,464,651 (emphasis added):

The resilient covering 44 can be applied as follows: After the last resin coating 42 has hardened, the surface thereof in the area where the resilient covering 44 is to be applied for example the roll work surface 24 is washed with acetone. After the acetone has dried, the reinforced resin layer 40-42 is grit blasted to an extent preferably to expose some of the reinforcing fiber 40. Then the composite structure is subjected to a rough sanding to improve the regularity of the coating surface, or in the case of the roll 10, is rough machined or turned to ensure symmetry, as pointed out above. Certain of the aforementioned elastomers, for example, polyurethane rubber, will then bond securely to any of the aforesaid resins (polyester, phenolic, or expoxy) without further surface treatment of the reinforced resin layer. This bonding is made more secure by adherence to the exposed reinforcing fiber. On the other hand, Neoprene rubber can be bonded to the thus prepared resin surface, for example, by first coating with a solution of Neoprene rubber in toluol. Natural, nitrile, or silicone rubber can be adhered by first applying a similarly suitable elastomeric material dissolved in a suitable solvent, to the roughened surface of the final, reinforced plastic layer 40-42.

Essentially the same statement can be found in the second U.S. patent newly relied upon by the Examiner. In other words, both the McGaughey patents and WATANABE confirm that one of ordinary skill in the art can by no means simply assume that replacing the polyurethane in the process of SONDHE by the polyurethane of GAJEWSKI (or any other significantly different polyurethane) will result in a satisfactory adhesion between the epoxy layer and the polyurethane layer, the more so since the epoxy resin of SONDHE does not contain any reinforcing fiber (which according to the McGaughey patents increases the adhesion).

In view of the foregoing, Applicant maintains the position that it would not be known to one of ordinary skill in the art if there is sufficient adhesion between the epoxy base coat of SONDHE and the polyurethane made from the prepolymer composition of GAJEWSKI.

Regarding instant claims 25 and 43 which recite (*inter alia*) that the synthetic resin is applied onto the polyurethane gel coat material Applicant notes that the Examiner now relies on a single word in a single sentence of SONDHE, i.e., the word “generally” in the sentence in col. 13, lines 5-7 of SONDHE: “Since the epoxy composition has a good bonding strength, it is generally utilized as a base or substrate interface layer”. Even if one were to assume, *arguendo*, that this sentence suggests that alternatively, the epoxy layer can be used as the top layer and the polyurethane layer can be used the base layer it is not seen that any advantage can be obtained by reversing the sequence of layers. SONDHE neither suggests that the polyurethane layer provides good adhesion to a substrate (bonding strength) or any other property desirable for a base layer nor

suggests that the epoxy layer exhibits good weatherability and abrasion-resistance or any other property desirable for a top layer but does point out that the epoxy layer has a good bonding strength and does point out that the polyurethane layer has good weatherability and abrasion-resistance. Accordingly, even if SONDHE were assumed to not exclude the use of the epoxy layer as a top layer and the polyurethane layer as a base layer on a substrate it cannot reasonably be denied that SONDHE does not set forth any advantages that may be obtained thereby. In other words, SONDHE fails to provide an apparent reason for one of ordinary skill in the art to use the epoxy layer as a top layer and the polyurethane layer as a base layer. Quite to the contrary, it is apparent that with a corresponding (reversed) arrangement one would forfeit all of the advantages pointed out by SONDHE, i.e., the good bonding to substrate surfaces provided by the epoxy layer (as a top layer it would not come into direct contact with the substrate) and the good weatherability resistance and good abrasion resistance of the polyurethane layer (as a base layer it would be covered and protected by the epoxy layer and thus, would neither be subjected to abrasive forces nor to weather-related stresses). In other words, SONDHE clearly fails to provide an apparent reason for one of ordinary skill in the art to reverse the order of layers taught therein.

Applicant submits that for at least all of the foregoing reasons and the additional reasons set forth in the response to the previous Office Action, the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of any of the present claims in view of SONDHE and GAJEWSKI. Accordingly, withdrawal of the instant rejection is warranted, which action is again respectfully requested.

***Response to Rejection of Claims 26, 27 and 42 under 35 U.S.C. § 103(a)***

Claims 26, 27 and 42 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SONDHE in view of GAJEWSKI and in view of MOTSINGER for the reasons set forth in the previous Office Action.

Applicant again respectfully traverses this rejection for all of the reasons which are set forth in the response to the previous Office Action. The corresponding remarks are expressly incorporated herein.

It is pointed out again that there is no motivation to combine the teachings of SONDHE and MOTSINGER because the latter document is non-analogous art with respect to the former document (and GAJEWSKI). The test for non-analogous art is first whether the art is within the field of the inventor's endeavor and, if not, whether it is reasonably pertinent to the particular problem with which the inventor was involved. In re Wood, 599 F.2d 1032, 1036 (CCPA 1979). "A reference is reasonably pertinent if, even though it may be in a different field" of endeavor, it logically would have commended itself to an inventor's attention in considering his problem "because of the matter with which it deals." In re Clay, 966 F.2d 656, 659 (Fed. Cir. 1992).

There can be no reasonable dispute that SONDHE (relating to epoxy resin/polyurethane laminates for use as road lane markers; see, e.g., abstract of SONDHE) and MOTSINGER (relating to a force vector transducer and mentioning (foamed) polyurethanes and polyester or epoxy resins only generically as examples of suitable materials for the outer surface of the inner shell and the outer shell of the force vector transducer taught therein) are not from the same field of endeavor. There can also no dispute that the required property profiles of materials that may be used for making

road lane markers on the one hand and of materials for making force vector transducers on the other hand are entirely different.

In Van Wanderham, an inventor claimed a rocket propelled missile booster cryogenic liquid propellant flow system having an insulating layer. Prior art that described material used in making cutlery was argued to show obviousness. The court found the reference not analogous, explaining that “the difficulty arises from not considering the subject matter as a whole and instead focusing on the scientific principle involved. ... Considering the facts of record, we are of the view that appellants, in view of the conditions set forth in section 103, are not chargeable with the knowledge set forth in the cutlery art.” In re Van Wanderham, 378 F.2d 981, 988 (CCPA 1967). In this regard, see also the decision of the BPAI of April 6, 2011 in appeal 2010-011637.

Applicant submits that for at least all of the foregoing reasons and the additional reasons set forth in the response to the previous Office Action, SONDHE, GAJEWSKI and MOTSINGER are unable to render obvious the subject matter of any of the claims of record, wherefore withdrawal of the instant rejection is again respectfully requested.

**CONCLUSION**

In view of the foregoing, it still is believed that all of the claims in this application are in condition for allowance, wherefore an early issuance of the Notices of Allowance and Allowability is again respectfully solicited. Should there be any issues that can be resolved during a teleconference the Examiner is respectfully invited to contact the undersigned at the telephone number indicated below.

Respectfully submitted,  
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/Heribert F. Muensterer/  
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